

## Claims

We claim:

- 1 1. A method for transmitting an input stream of data symbols in a multiple-  
2 input/multiple-output wireless communications system, comprising:  
3       demultiplexing the input stream into  $M$  substreams;  
4       adaptively modulating and coding each of the  $M$  substreams to a coded  
5 substream;  
6       space-time transmit diversity encoding a first of the  $M$  coded substreams into  
7 two space-time transmit diversity encoded substreams, one space-time transmit  
8 diversity encoded substream to be transmitted by a corresponding one of two  
9 transmit antenna; and  
10       transmitting directly each other coded substream by a corresponding single  
11 transmit antenna.
- 1 2. The method of claim 1 further comprising:  
2       feeding back, from a receiver, channel conditions of an associated channel  
3 for each transmit antenna.  
4       selecting a maximum data rate and a modulation for each substream based  
5 on the channel conditions.
- 1 3. The method of claim 2, in which the channel conditions measure a signal to  
2 interference plus noise ratio of the output streams received in the receiver.

1 4. The method of claim 1, in which the adaptive modulating and coding, further  
2 comprises:

- 3 coding each substream;
- 4 interleaving each coded substream; and
- 5 symbol mapping each interleaved substream.

1 5. The method of claim 1, further comprising:

- 2 demultiplexing each output stream into a plurality demultiplexed output
- 3 streams;
- 4 multiplying each of the plurality of demultiplexed output streams by an
- 5 orthogonal variable spreading factor;
- 6 adding the demultiplexed output streams, for each output stream, after
- 7 multiplication into a summed output stream corresponding to each output stream;
- 8 and
- 9 multiplying each summed output stream by a scrambling code.

1 6. The method of claim 1, further comprising:

- 2 space-time transmit diversity encoding each of a subset of the  $M$  coded
- 3 substreams into two space-time transmit diversity encoded substreams, one space-
- 4 time transmit diversity encoded substream to be transmitted by a corresponding
- 5 one of two transmit antenna; and
- 6 transmitting directly each other of the  $M$  coded substream not included in the
- 7 subset by a corresponding single transmit antenna.

1 7. The method of claim 2, further comprising:

- 2 selecting the number  $M$  of substreams based on the channel condition.

1 8. An apparatus for transmitting an input stream of data symbols in a multiple-  
2 input/multiple-output wireless communications system, comprising:  
3  $M+1$  transmit antennas;  
4 a demultiplexer configured to demultiplex the input stream into  $M$   
5 substreams;  
6  $M$  means for adaptively modulating and coding each of the  $M$  substreams to  
7 a coded substream;  
8 means for space-time transmit diversity encoding a first of the  $M$  coded  
9 substreams into two space-time transmit diversity encoded substreams, one space-  
10 time transmit diversity encoded substream to be transmitted by a corresponding  
11 one of two transmit antenna; and  
12 means for transmitting directly each other  $M-1$  coded substream by a  
13 corresponding single transmit antenna.